Response under 37 C.F.R. 1.116
- Expedited Examining Procedure -
Examining Group 2622

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Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Qiang Luo

CHARGE DIFFUSION CROSSTALK REDUCTION FOR IMAGE SENSORS

Serial No. 10/688,657

Filed 17 October 2003

Group Art Unit: 2622

Examiner: Henn, Timothy J.

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Pre-Appeal Brief Request For Review

Sir:

Applicant requests a review of the final rejection in the above-identified application. No amendments are being filed with this request. The request is being filed with a Notice of Appeal.

This review is requested for the reasons stated on the attached pages.

Claims 1-19 stand rejected under 35 U.S.C. 102(a) as being anticipated by Prentice et al. (US 2003/0030729; hereinafter "Prentice").

Based on the Examiner's Response to Arguments in the final office action, Applicant would like to provide a brief discussion of crosstalk in image sensors. There are different types of crosstalk in image sensors. For example, spectral crosstalk is caused by unwanted light of other colors passing through specific filters in the color filter pattern. Unwanted light can pass through specific filters when the material properties of the color filters are imperfect or the color filter pattern is misaligned with respect to the underlying pixels.

Another type of crosstalk is optical crosstalk, which is caused by optical diffraction, refraction, and reflection. Since the color filters are positioned at a given distance from the pixel surface, light propagating at angles may pass through the filter or reflect off the surface and be partially absorbed by an adjacent pixel. And another type of crosstalk is electrical crosstalk, which is caused by charge diffusion or migrating photocarriers is known as electrical crosstalk. See, for example, paragraphs [0033] through [0035] in United States Patent Application Publication 2003/0006363 A1 and "Improvement of Crosstalk on 5M CMOS Image Sensor with 1.7x1.7um2 Pixels" by Koo, Chang-Hyo et al., SPIE Vol. 6471, 647115-1 (2007) for a brief discussion of the different types of crosstalk in CMOS image sensors.

Thus, Applicant respectfully submits the Examiner is incorrect when the Examiner states on page 2 of the final office action "the system of Prentice would necessarily correct for cross-talk caused by charge diffusion/migrating electrons as claimed since charge diffusion/migrating electrons are a cause of cross-talk in image sensors." Correcting for one type of crosstalk does not necessarily correct for additional or all types of crosstalk.

Applicant's independent claims 1 and 8 recite "inputting crosstalk coefficients for a first pixel of a first color for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "applying diffusion crosstalk coefficients

applicable to the first pixel to the measured value of the first pixel and the measured values of the adjacent pixels to generate a calculated first pixel value with reduced charge diffusion crosstalk." Independent claim 15 recites "a memory comprising crosstalk coefficients for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "an arithmetic processor that is configured to apply the crosstalk coefficients to the first measured pixel value and the adjacent measured pixel values such that first order crosstalk effects are reduced in the first measured pixel value." Applicant respectfully submits Prentice does not teach, either directly or inherently, a method or system for reducing charge diffusion crosstalk or crosstalk caused by migrating electrons.

Prentice discusses the use of a conventional 3x3 matrix in a color correction step in paragraph [0039] Prentice describes the 3x3 matrix as a conventional color matrix of the type used to correct for color crosstalk as described in a journal article entitled "High-Performance Digital Color Video Camera." This journal article by Kenneth A. Parulski et al. describes color correction similar to the color correction described in the present application beginning in the paragraph bridging pages 6 and 7 of the application. But this color correction is separate and distinct from the crosstalk calibration due to charge diffusion crosstalk and electron migration recited in the independent claims.

The Kenneth A. Parulski et al. article describes the color correction in section 6 beginning on page 41 of the article. The first sentence on page 42 states "[a] mask programmable 3 X 3 color correction matrix is used to improve the color reproduction be correcting the camera responsiveness property for the display phosphor chromaticities." The first full sentence after the equations (3) on the same page states "The coefficients a_{ij} depend on the color-mixture functions of the phosphors used in the television display and the responsivities of the RGB signals prior to matrixing, which includes the lens, infrared blocking filter, and color sensor." Nothing found in the Parulski et al article discloses or suggests reducing charge diffusion crosstalk or reducing crosstalk caused by migrating electrons. Similarly, Prentice does not teach, either directly or

inherently, a method or system for reducing charge diffusion crosstalk or crosstalk caused by migrating electrons.

In order for a reference to anticipate an invention, each and every element of the claimed invention must be found in a single reference. "The identical invention must be shown in as complete detail as is contained in the ... claim." MPEP § 2131. Applicant respectfully submits Prentice does not anticipate Applicant's independent claims 1 and 8 because Prentice does not teach "inputting crosstalk coefficients for a first pixel of a first color for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "applying diffusion crosstalk coefficients applicable to the first pixel to the measured value of the first pixel and the measured values of the adjacent pixels to generate a calculated first pixel value with reduced charge diffusion crosstalk." Prentice also does anticipate independent claim 15 because Prentice does not disclose" a memory comprising crosstalk coefficients for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "an arithmetic processor that is configured to apply the crosstalk coefficients to the first measured pixel value and the adjacent measured pixel values such that first order crosstalk effects are reduced in the first measured pixel value."

Moreover, when evaluating a claim, the claim as a whole must be considered, and as such, every limitation in the claim must be considered. MPEP § 2106. It "is incumbent upon the examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference." Ex parte Levy, 17 USPQ2d 1461, 1462 (Bd Pat App & Inter 1990). Applicant notes the Examiner did not cite in the final office action where all of the claim limitations in independent claims 1, 8, and 15 are taught in Prentice. In particular, the Examiner did not identify where in Prentice "inputting crosstalk coefficients for a first pixel of a first color for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "applying diffusion crosstalk coefficients applicable to the first pixel to the measured value of the first pixel and the measured values of the

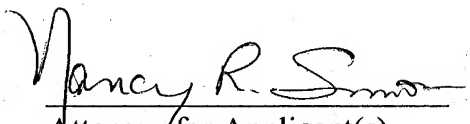
adjacent pixels to generate a calculated first pixel value with reduced charge diffusion crosstalk" are disclosed. Additionally, the Examiner did not identify where "a memory comprising crosstalk coefficients for reducing diffusion crosstalk caused by electrons migrating to the first pixel from adjacent pixels of colors that are different from the first color" and "an arithmetic processor that is configured to apply the crosstalk coefficients to the first measured pixel value and the adjacent measured pixel values such that first order crosstalk effects are reduced in the first measured pixel value" are disclosed in Prentice.

Based on the foregoing, Applicant respectfully submits the anticipation rejection of independent claims 1, 8, and 15 in view of Prentice is incorrect.

"Claims in dependent form shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim." 37 CFR § 1.75. Claims 2-7 depend from and include all of the limitations of independent claim 1, claims 9-14 depend from and include all of the limitations of independent claim 8, and claims 16-19 depend from and includes all of the limitations of independent claim 15. For at least the reasons discussed above, Prentice does not anticipate independent claims 1, 8, and 15. Accordingly, dependent claims 2-7, 9-14, and 16-19 are also not anticipated by Prentice.

In light of the above remarks, Applicant respectfully requests the rejection under 35 U.S.C. 102(a) for being anticipated by Prentice be reversed and claims 1-19 be allowed.

Respectfully submitted,



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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.